Virginia Polytechnic Institute and State University  
Bradley Department of Electrical and Computer Engineering

ECE 2504:  Introduction to Computer Engineering  
CRN: 91803: MWF 11:15 AM – 12:05 PM, Randolph 331

Instructor:  
Dr. Dong Ha

Office:  
337 Durham

Phone:  
231-4942

E-Mail:  
ha@vt.edu

Office Hours:  
Tuesdays 1:30– 3:00 PM, Thursdays 3:00 -5:00 PM (tentatively) and by appointment (send e-mail).

Required Materials:  
(ISBN: 0-536-98668-1) This is a “custom publishing” text for this course and contains only the first four chapters of the text.


ECE 2504 Laboratory Manual (the CEL web page: http://www.ece.vt.edu/cel)

ECE 2504 Trainer Kit & Chip Set (the CEL web page)

Course Objective:  
The objective of this course is for each student to comprehend the fundamental concepts of computer engineering. The course is targeted at engineering and computer science students who may use computers or who may design computers or other digital systems. The course introduces basic principles and design concepts spanning a range of topics from digital logic to computer organization and assembly language programming. The course prepares students for more advanced courses in computer architecture (ECE/CS 4504), digital design (ECE 3504/4514), and microprocessors system design (ECE 3534).

Major Measurable Learning Objectives:

- represent and manipulate information in binary form,
- design and construct basic combinational and sequential logic circuits,
- implement designs represented in a register transfer language,
- discuss the organization and operation of a basic digital computer,
- discuss the functions of medium scale integrated circuits,
- write machine language computer programs and discuss their execution by a basic computer,
- write elementary assembly language programs and discuss their translation to machine language programs, and
- write reports on hardware and software design projects.

Prerequisites:  
ECE 1574 (Engineering Problem Solving with C++) is a prerequisite for this course. The department is enforcing this policy. It is expected that the students have had some experience in programming and computer use. You are also expected to have a sufficient level of maturity to undertake small, independent design projects.
Grading: Final Exam 20%
Two Mid-terms 30% (15% each)
Homework 10%
Quizzes 10%
Five design projects 30%
(Pr0: 2%, Pr1: 6%, Pr2: 8%, Pr3: 6%, Pr4: 8%)
100%

Final semester grades will be determined after all work is completed and graded. Point ranges for letter grades will be based on a number of factors, including absolute and relative performance. Letter grades will not be determined by a fixed curve or a fixed point range. Students with questions about their performance or concerns about grades or class standing should discuss them with the instructor.

Grading policies: All homework and design projects are due at the beginning of class on their due dates. Late ones, but submitted in the class, are subjected to 50% of the penalty of the earned points. Other later ones will not be accepted. Work that is not turned in will be assigned a grade of zero.

A zero in two or more design projects will result in an overall semester grade of zero in the design project grading category.

If you feel that an error has been made in the grading of an assignment or an exam, you must present the work along with a written appeal to the instructor within one week after the graded work is returned to you. Verbal appeals will not be considered. Grades will not be changed after the one week period. Appeals should address specific grading errors -- negotiations over partial credit will not be considered. Questions on homework, quiz and project grading must be submitted to the responsible GTA and questions on examinations to the instructor.

Examinations: There will be two mid-term examinations and a comprehensive final examination. All examinations will be closed book, closed notes.

Students are expected to take all examinations during the announced time periods -- NO makeup examinations will be given! If you miss a mid-term examination for a reason that has been approved in advance, the weighting of your final exam will be increased by the weight of the mid-term (e.g., if you miss an exam, you final will constitute 35% of your final grade). Missed exams without prior approval will be scored as zeroes.

Schedule:
Midterm #1: September 24 (Monday)
Midterm #2: October 31 (Wednesday)
Final: December 10 (Monday.) 10:05 AM – 12:05 PM

Homework: Homework assignments will include problems from the textbook and other problems. Work on homework problems during the week to help you understand lectures and the text. You may want to make a copy of your homework before submitting it since it may not be returned before the next exam.

All homework will be graded, with the grade based on effort for all problems and the correctness of one or more selected problems. The selected problems to be graded for correctness will not be announced prior to submission.
Students may discuss general approaches to solving H/W problems among themselves. The actual solutions that are turned in for grading are expected to be the original work of the individual student. See the section on the Honor Code in this syllabus.

Homework may be hand written. However, all information that is turned in for grading should be neat, clearly organized, and legible. Work that cannot be easily read (in the opinion of instructor or GTA) will receive no credit. Be sure to staple your pages together.

Quizzes: Short, unannounced, in-class quizzes will be given. The quizzes will be on material covered recently in lecture or reading assignments, topics relevant to projects, and/or problems assigned as part of the homework assignments. Quizzes will be closed book and notes. The one lowest quiz grade will be dropped in computing the overall quiz grade. Make-up quizzes will not be given. If you miss a quiz, you will receive a grade of zero for that quiz.

Design Projects: Five laboratory design projects will be assigned during the course. The projects will be split between hardware and software aspects of computer design.

Grading for Projects 1-4 will be based on a 70/30 split as follows: 70% on the technical aspects of the project (e.g., correctness of operation, efficiency, and completion of technical requirements) and 30% on the manner of presentation of the report (e.g., organization of the report's content, thorough documentation, grammar, and spelling).

Design project reports should be prepared using a word processor. All figures and schematic diagrams should be prepared using a computer drawing package or CAD tool. Sample reports are available on the CEL web page. Additional requirements/expectations for the reports are contained in the course lab manual and individual project assignments.

Hardware projects will consist of digital circuit design using 7400 series logic devices. Project operation must be validated by GTAs on duty in the Computer Engineering Lab (CEL, Durham Hall 368 and 375). Lab hours will be posted. Projects will be built on a hardware trainer kit that ECE students must purchase and that CS students sign out from the ECE Shop. Procedures for purchasing kits/parts are posted on the CEL web page (http://www.ece.vt.edu/cel).

The software projects will require designing and implementing assembly language programs and simulating their execution using the PIC processor simulator. Details on obtaining the PIC software tools will be announced in class.

Honor Code: Honesty in your academic work develops into professional integrity. As such, the Honor Code will be strictly enforced in this course. All aspects of your course work are covered by the Honor System. All examinations, design projects, homework, and quizzes are expected to be your own individual work unless otherwise noted. Report any suspected violations of the Honor Code promptly. Discussion and cooperative learning on general topics covered in the course is encouraged. However, using another person's solution, design, implementation, computer program or files and/or other specific results is prohibited and will be considered as an Honor Code violation.

Special Needs: Any student who is having difficulty in the course or who feels that he or she may need an accommodation because of a disability should see the instructor during his office hours. Reasonable accommodations are available for students who have documentation of a disability from a qualified professional. Students should work through Services for Students with Disabilities (SSD) in 152 Henderson Hall. Any
student with accommodations through the SSD Office should contact the instructor during the first two weeks of the semester.

Students requesting accommodations due to potential conflicts with the observance of specific religious or ethnic holidays or time periods should contact the instructor in the first two weeks of the semester.

**Lectures:**

Attendance will not be taken, but you are expected to attend lectures. If you must miss class, you are responsible for obtaining the notes from a classmate. Cell phones must be turned off during class. The lecture note for a class meeting will be posted on the class web page (Web: www.ee.vt.edu/ha/courses/ece2504) by midnight the night before.

**General:**

You are expected to show courtesy to the other students and the instructor by *not talking nor creating other disturbances* during class. Your cooperation is strongly requested and would be appreciated.
### Tentative Course Schedule

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Topics</th>
<th>Reading</th>
<th>Special Event</th>
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<tr>
<td>1</td>
<td>Aug. 20- Aug. 24</td>
<td>Data Types</td>
<td>3-1</td>
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<td>2</td>
<td>Aug. 27- Aug. 31</td>
<td>Complements</td>
<td>3-2</td>
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<td>3</td>
<td>Sept. 3 -Sept. 7</td>
<td>Fixed / Floating-Point Representations</td>
<td>3-3,4</td>
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<td>4</td>
<td>Sept. 10 - Sept. 14</td>
<td>Gray code, Boolean Algebra ANDY board</td>
<td>3.5, 1-3, 4</td>
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<td>5</td>
<td>Sept. 17 - Sept. 21</td>
<td>K-maps</td>
<td>1-4</td>
<td>Midterm #1 (Monday, Sept. 24)</td>
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<td>6</td>
<td>Sept. 24 - Sept. 28</td>
<td>Comb. Circuits Flip-Flops</td>
<td>1.5, 1.6</td>
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<td>7</td>
<td>Oct. 1- Oct. 5</td>
<td>Decoders, MUXes</td>
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<td>Oct. 8 - Oct. 12</td>
<td>Shift registers, Memories</td>
<td>2-5, 6, 7</td>
<td>Fall Break (Monday, Oct. 8)</td>
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<td>9</td>
<td>Oct. 15 - Oct. 19</td>
<td>Register Transfers Arithmetic microoperations</td>
<td>4-2,3,4</td>
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<tr>
<td>10</td>
<td>Oct. 22 - Oct. 26</td>
<td>Arithmetic microoperations</td>
<td>4-6,7</td>
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<td>11</td>
<td>Oct. 29 - Nov. 2</td>
<td>PIC intro and overview</td>
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<td>Midterm #2 (Wed, Oct. 31).</td>
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<td>Nov. 5 - Nov. 9</td>
<td>PIC Instruction</td>
<td>PIC</td>
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<td>13</td>
<td>Nov. 12 - Nov. 16</td>
<td>Stack and Subroutine</td>
<td>PIC</td>
<td>No class on Friday</td>
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<td>14</td>
<td>Nov. 26 - Nov. 30</td>
<td>Registers, Fetch and Execute Cycles, Design</td>
<td>PIC</td>
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<td>15</td>
<td>Dec. 3 - Dec. 5</td>
<td>Review</td>
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Have a Happy Thanksgiving Break

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<th>Final Exam: Dec. 10 (Monday,) 10:05 AM – 12:05 PM</th>
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Hope you work hard, learn a lot and enjoy the course.